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Ohara

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(54) **IMAGE FORMING APPARATUS USING ERASE LIGHT**

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(51) **Int. Cl.**[7] **G03G 21/00**

(52) **U.S. Cl.** **399/128**

(58) **Field of Search** 399/128, 186, 399/219, 220, 221, 299, 179

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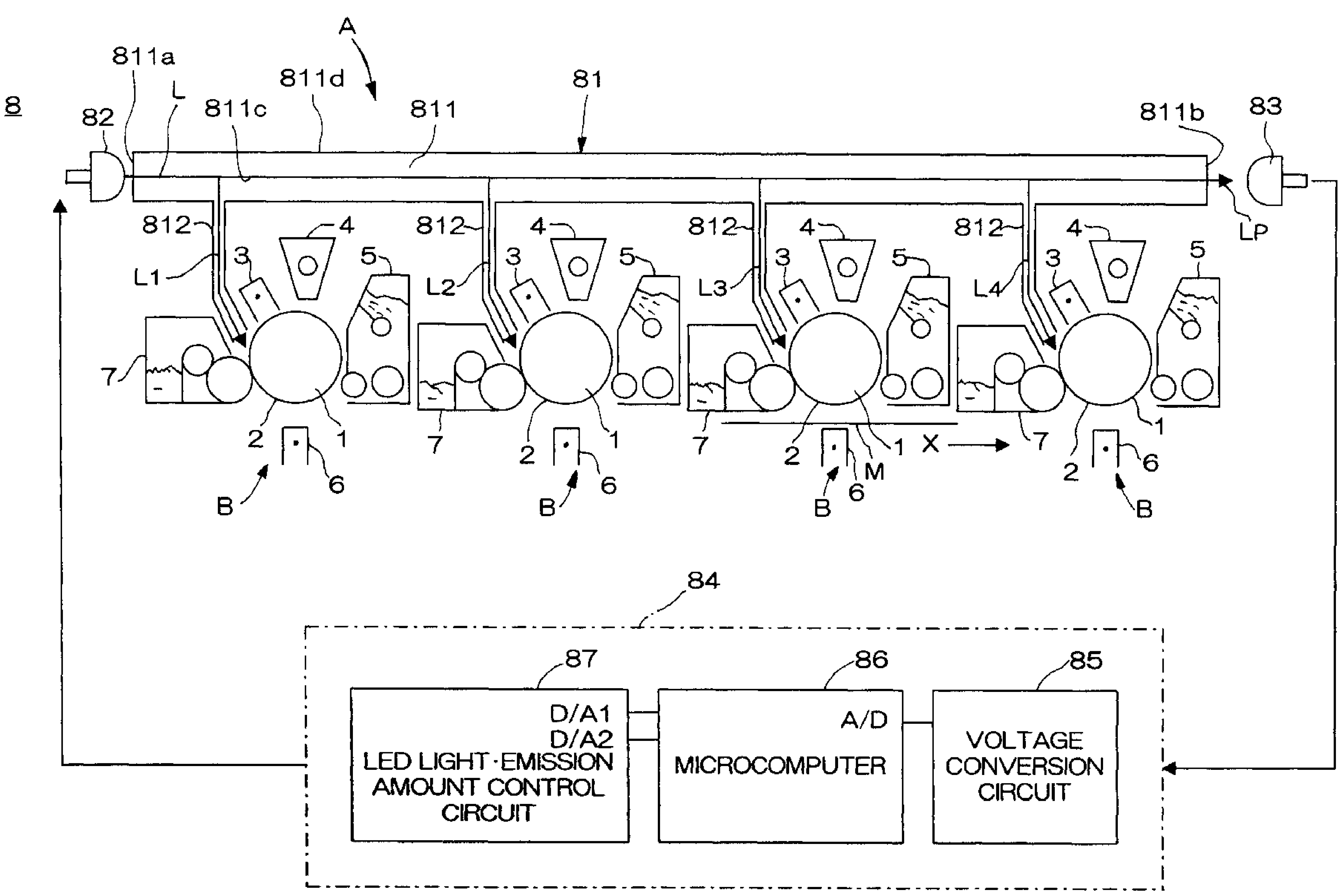
(57) **ABSTRACT**

The present invention provides a simplified configuration to an image forming apparatus having a photoconductive member by making use of a waveguide (light propagation) member capable of easily diverging and/or refracting light so that the photodutive member is discharged.

2 Claims, 5 Drawing Sheets



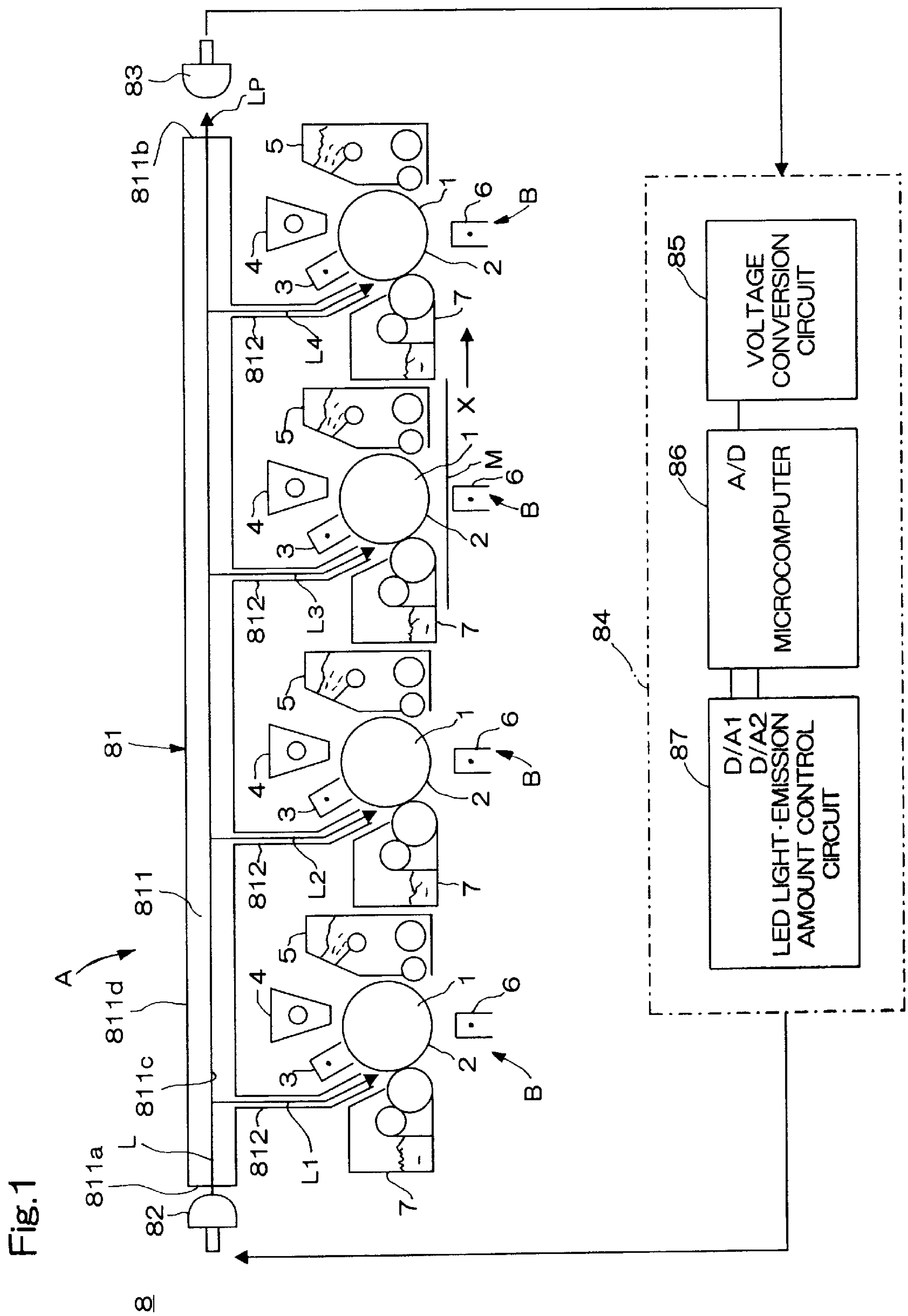
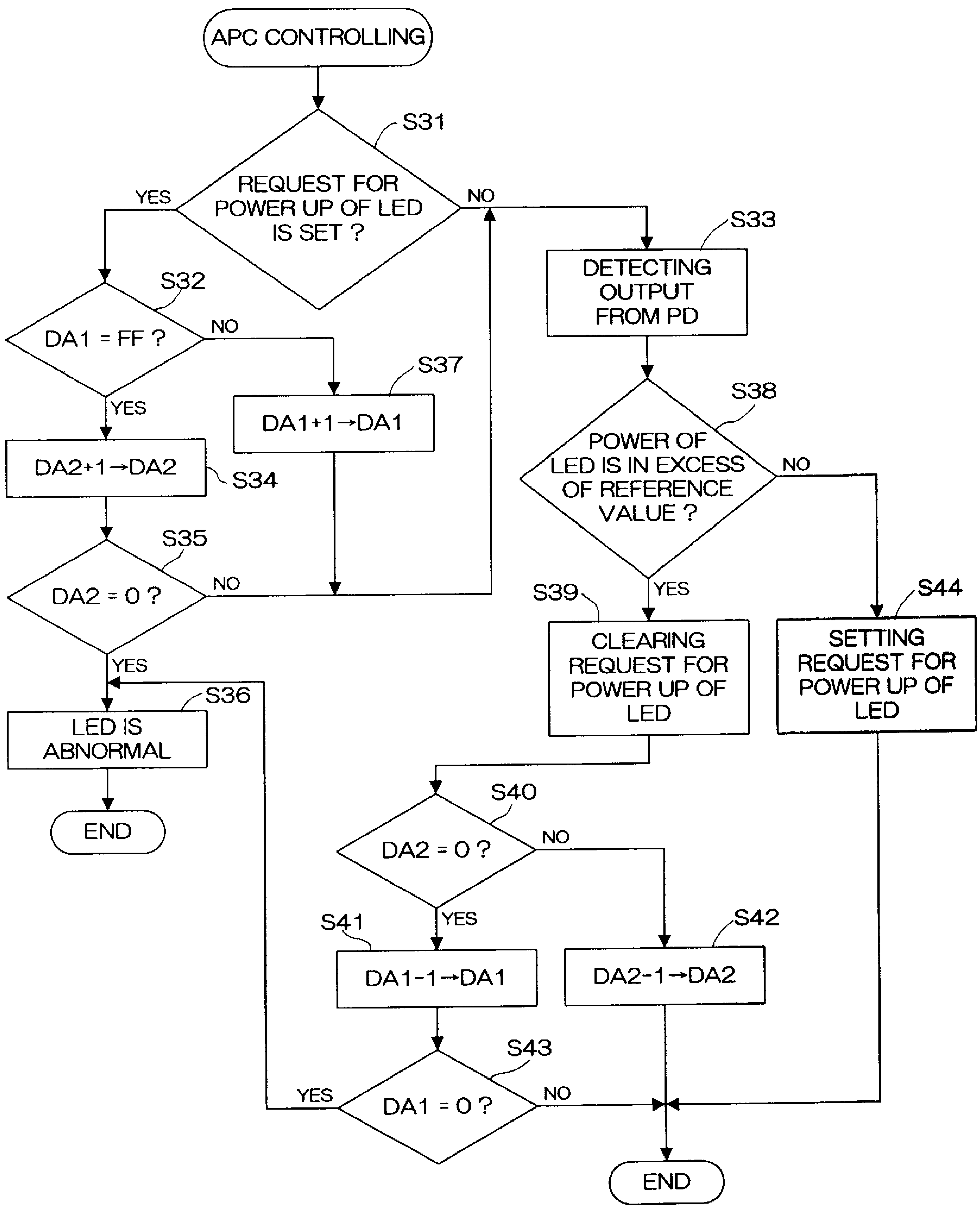


Fig.1
A
8
81
811
811a
811b
811c
811d
812
82
83
84
85
86
87
L
LP
L1
L2
L3
L4
X
M
B
1
2
3
4
5
6
7
VOLTAGE CONVERSION CIRCUIT
A/D
MICROCOMPUTER
D/A1
D/A2
LED LIGHT·EMISSION AMOUNT CONTROL CIRCUIT

Fig.2


APC CONTROLLING
S31
REQUEST FOR POWER UP OF LED IS SET ?
YES
NO
S32
DA1 = FF ?
NO
YES
S37
DA1+1→DA1
DA2+1→DA2
S34
S35
DA2 = 0 ?
NO
YES
S36
LED IS ABNORMAL
END
S33
DETECTING OUTPUT FROM PD
S38
POWER OF LED IS IN EXCESS OF REFERENCE VALUE ?
NO
YES
S39
CLEARING REQUEST FOR POWER UP OF LED
S44
SETTING REQUEST FOR POWER UP OF LED
S40
DA2 = 0 ?
NO
YES
S41
DA1-1→DA1
S42
DA2-1→DA2
S43
DA1 = 0 ?
YES
NO
END

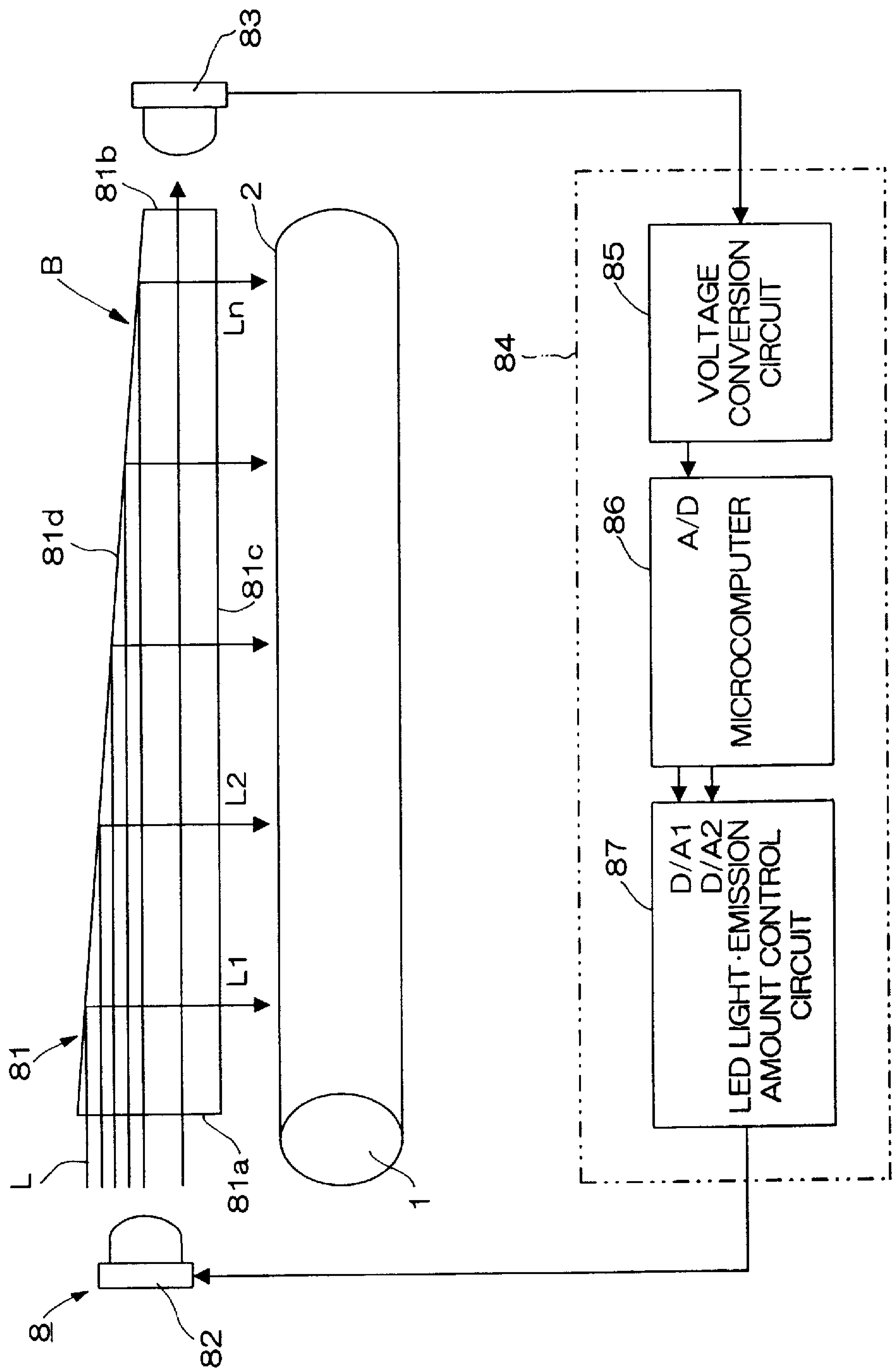

83
81b
2
B
Ln
85
VOLTAGE CONVERSION CIRCUIT
84
81d
81c
86
A/D
MICROCOMPUTER
L2
87
D/A1
D/A2
LED LIGHT·EMISSION AMOUNT CONTROL CIRCUIT
L1
81
L
81a
1
8
82

Fig.3

Fig.4

PRIOR ART

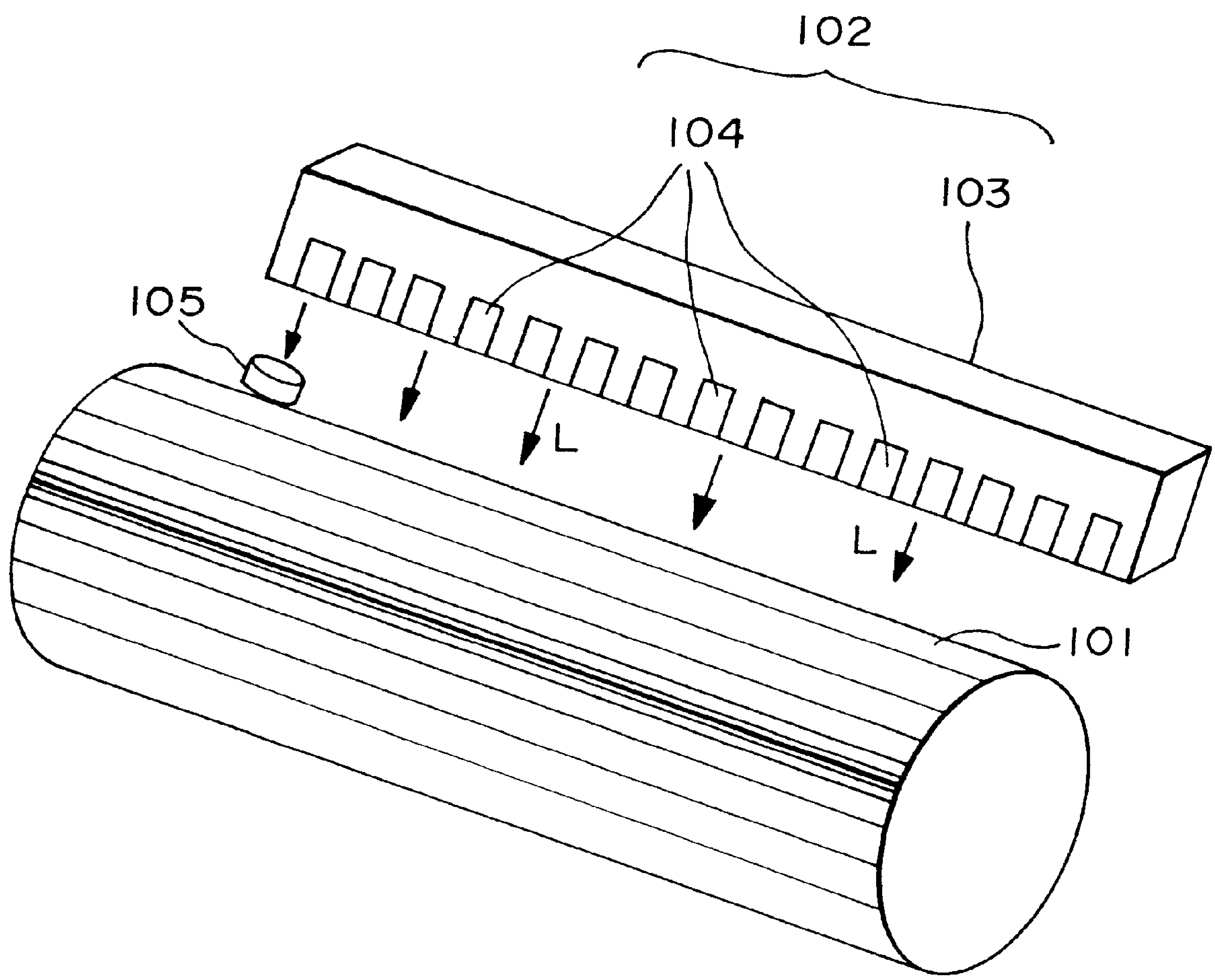


Fig.5

PRIOR ART

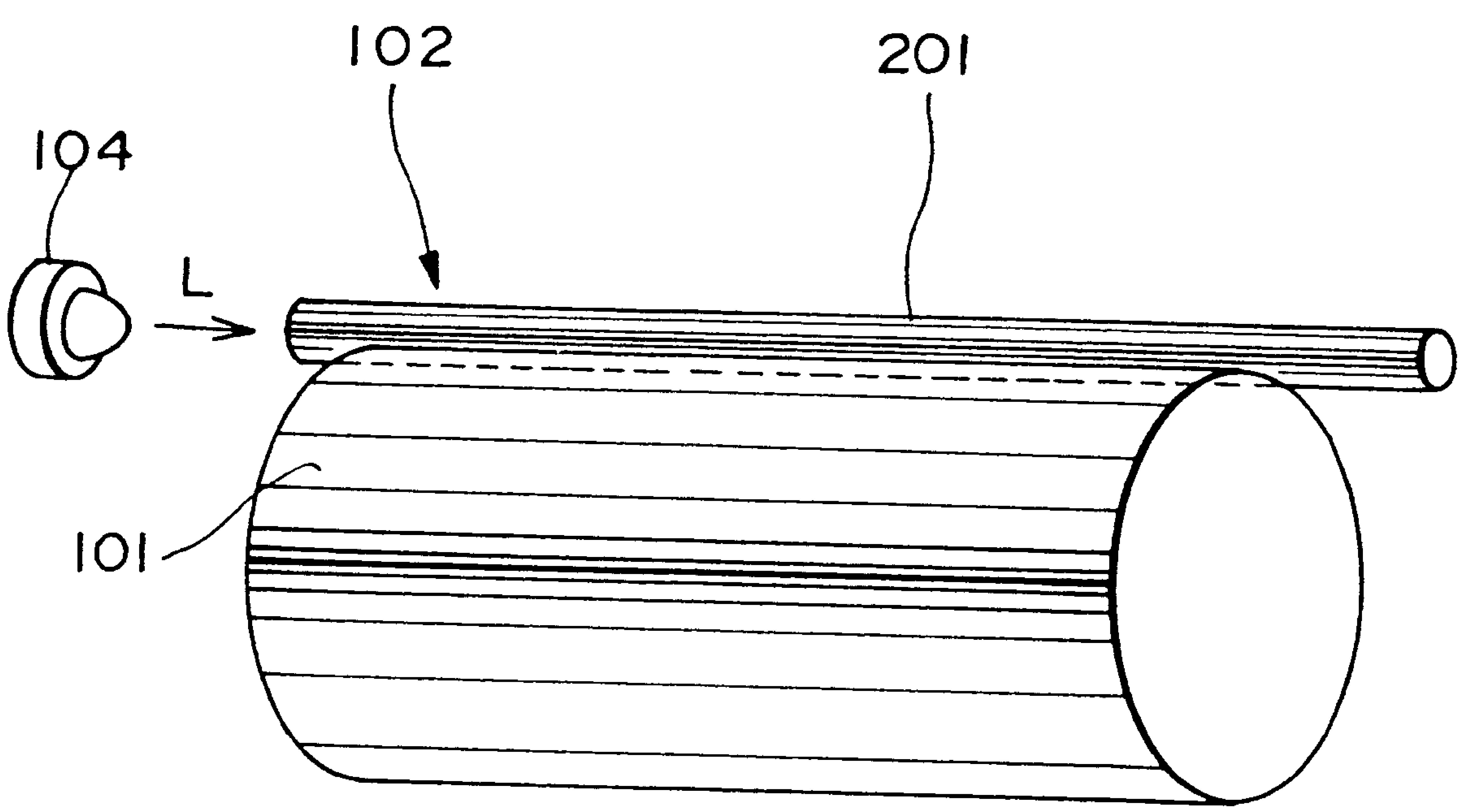


IMAGE FORMING APPARATUS USING ERASE LIGHT

RELATED APPLICATION

This application is based on application No. H11-025391 field in Japan, the entire content of which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an image forming apparatus such as a laser beam printer, an electrostatic photocopier, or the like, and more particularly concerns an image forming apparatus which incorporates an improved light eraser for removing electric charges from a photoconductive member.

2. Description of the Related Art

In a typical image forming apparatus such as a laser beam printer and an electrostatic photocopier, an electrostatic latent image is formed on a photoconductive member overlying the outer peripheral surface of a rotating drum, which is then followed by (a) a toner development process in which particles of toner powder are adhered to the photoconductive member, (b) a transfer process in which a toner pattern on the photoconductive member is transferred onto a copy paper sheet, and (c) a fixing process in which the transferred toner pattern is affixed to the copy paper sheet. Thereafter, as preparations for the next image forming process, residual toner powder particles remaining on the photoconductive member are removed therefrom and the surface of the photoconductive member is illuminated with light rays from a light eraser located face to face with the photoconductive member so that residual electric charges remaining in the photoconductive member are optically removed.

A light eraser is required to illuminate light rays across the entire width of a photoconductive member. For the case of a full-color photocopier having a plurality of photoconductive members, it is necessary to illuminate light rays across the entire width of each of the plurality of photoconductive members.

a) FIG. **4** shows a prior art technique (i.e., a light eraser **102**) for applying light rays across the entire width of a photoconductive member, wherein a plurality of light-emitting diodes (hereinafter called the LEDs) **104** or a plurality of incandescent electric lamps serving as light sources are mounted on a substrate **103** in a side by side fashion in the axial direction of a photoconductive member **101**. However, the problem with the light eraser **102** is that the LEDs **104** are likely to vary in performance, resulting in illuminating the photoconductive member **101** at different quantities of light. Therefore, the photoconductive member **101** cannot uniformly be discharged across its entire length. In order to avoid such a drawback, it has been proposed to employ a light receiving element **105** such as a photosensor for detecting the quantity of light. However, it is practically difficult to measure the quantity of light for each LED **104** because of some constraints such as limitations of space. Additionally, since the number of component parts increases, this will establish limits to improving durability as well as to reducing manufacturing costs.

b) In a full-color photocopier of a tandem type, a plurality of photoconductive members are each provided with a light eraser. Recently, with the downsizing of electrophotographic copiers, the size of photoconductive members is likewise reduced. Accordingly, it is necessary to reduce a space between devices (e.g., cleaners and chargers) mounted in the vicinity of a photoconductive member. It is therefore difficult to achieve the downsizing of photoconductive members when an LED unit as a light eraser is provided to each photoconductive member. The reason is that, when an LED unit is disposed around the periphery of a photoconductive member, space must be secured for the LEDs and a substrate.

Use of optical fibers may provide solutions to these problems with the prior art techniques. More specifically, in order to solve the problem a), a single light source **104** such as a lamp for electric charge removing is mounted and an optical fiber **201** is disposed such that it runs along specified portions of the photoconductive member **101** from the light source **104** as shown in FIG. **5**. Formed on the outer peripheral surface of the optical fiber **201** on the opposite side to the photoconductive member **101** are a diffusion area extending along the longitudinal direction of the optical fiber **201** and a reflection area exterior to the diffusion portion. In such an arrangement, rays of light (L) from the light source **104** are reflected or diffused in the radial direction of the optical fiber **201** so that the specified portions of the photoconductive member **101** are illuminated for optically removing residual electric charges (see S62-127786).

In such a configuration, the single light source **104** applies the light L to the photoconductive member **101** through the optical fiber **201**. The use of the configuration, however, increases component part costs to a great extent because optical fibers are relatively expensive. Moreover, since the optical fiber **201**, when used as it is, is unable to diverge the light L toward the specified portions, the configuration in point has the disadvantage of lacking in latitude with respect to the guiding of the light L of the light source **104** toward the specified portions.

Also, for the problem b), it may be considered that a simplified apparatus configuration is accomplished by making utilization of an optical fiber so as to guide light rays from a single LED unit toward a plurality of photoconductive members. However, such arrangement is difficult to make for the same reason as described previously, and is costly.

To solve both the problem a) and the problem b), a waveguide member capable of easily achieving divergence, refraction, and transmission of light rays is required. By the use of such a waveguide member, it becomes possible to reduce the number of light sources required and, further, as for the problem a), it is possible to evenly apply light rays across the entire width of a photoconductive member.

SUMMARY OF THE INVENTION

Accordingly, a general object of the present invention is to provide solutions to the above-described problems.

Another object of the present invention is to provide a waveguide member (a light propagation member) capable of easily achieving divergence and/or refraction of light rays.

Still another object of the present invention is to provide a simplified configuration to an image forming apparatus having a photoconductive member.

A further object of the present invention is to provide a waveguide member capable of evenly apply light rays across the entire width of a photoconductive member.

A still further object of the present invention is to provide a light charge-removing unit capable of reducing the number of light sources for illuminating photoconductive members.

Another object of the present invention is to provide a light-quantity control device capable of performing control so that the light quantity of a light source for illuminating a photoconductive member is set to a desired value.

These and other objects are attained by an image forming apparatus of the present invention, the image forming apparatus comprising:

a plurality of photoconductive members on which images are formed according to the principle of electrophotography technology;

a light source; and

a waveguide member including a body portion where rays of light from the light source enter and a divergence portion by which the light rays from the light source are made to branch off from the body portion and are guided to the plurality of photoconductive members.

Further, the object of the present invention is attained by a light charge-removing unit which is incorporated in an image forming apparatus having a plurality of photoconductive members and which is operable to remove electric charges from posterior-to-transfer/prior-to-charge areas of the plurality of photoconductive members by subjecting the plurality of photoconductive members to exposure to light, the light charge-removing unit comprising:

a light source common to all of the plurality of photoconductive members; and

a waveguide member of guiding rays of light from the light source to each of the plurality of photoconductive members;

wherein the waveguide member includes a divergence portion by which the light rays emitted from the light source are made to branch off; and

wherein the light rays diverged in the divergence portion fall on the plurality of photoconductive members.

Further, the object of the present invention is attained by an image forming apparatus, the image forming apparatus comprising:

a photoconductive member on which an image is formed;

a single light source for optically removing residual electric charges remaining in the photoconductive member;

a waveguide member for guiding rays of light from the light source to illumination points so as to illuminate the photoconductive member;

a sensor which receives a part of the light rays from the light source through the waveguide member; and

a light-quantity controller for controlling, according to the amount of light received by the sensor, the light-emission amount of the light source;

wherein a plurality of the photoconductive members are provided.

The object of the present invention is attained by a light-quantity control device, the light-quantity control device comprising:

a light source which is incorporated in an image forming apparatus having a plurality of photoconductive members and which emits light rays to simultaneously illuminate the plurality of photoconductive members;

a sensor which receives light from the light source; and

a controller for varying the light-emission amount of the light source according to detection by the sensor.

The invention itself, together with further objects and attendant advantages, will best be understood by reference to the following detailed description taken in conjunction with accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic structure diagram illustrating major parts of a photocopier according to an embodiment of the present invention;

FIG. **2** is a flowchart diagram showing a light-quantity control procedure in a light eraser of the photocopier of FIG. **1**;

FIG. **3** is a schematic structure diagram illustrating major parts of a photocopier according to another embodiment of the present invention;

FIG. **4** is a perspective diagram illustrating a structure of a light eraser of a prior art image forming apparatus; and

FIG. **5** is a perspective diagram illustrating a structure of a light eraser of another prior art image forming apparatus.

In the following description, like parts are designated by like reference numbers throughout the several drawing figures.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, embodiments of the present invention will be described by reference to the drawings.

Referring first to FIG. **1**, there is schematically shown a structure of a full-color photocopier as one example of the image forming apparatus of the present invention.

FIG. **1** shows that a photocopier A has four image forming portions B disposed side by side along the direction in which a copy paper sheet M is fed and conveyed (i.e., the direction X indicated by the arrow). Each of these four image forming portions B comprises a rotational drum **1** which is disposed such that its axial direction is oriented normal to the feed direction of the copy paper sheet M, a photoconductive member **2** which is formed so as to cover the outer peripheral surface of the rotational drum **1**, a charger **3** which is arranged in the rotational circumference of the photoconductive member **2**, a printing head **4**, a developer **5**, a transfer device **6**, and a cleaner **7**. FIG. **1** further shows a light eraser **8**.

These four image forming portions B perform an image forming process step for K (black), an image forming process step for M (magenta), an image forming process step for C (cyan), and an image forming process step for Y (yellow), respectively. Prior to recording of image information, each of the photoconductive members **2** of the rotational drums **1** is charged with positive electric charges by the charger **3**. The photoconductive member **2** in such a charged state is subjected to exposure to light corresponding to specified image data by the printing head **4**, whereby an electric charge pattern corresponding to the image data is formed on the photoconductive member **2** in the form of a latent image.

By the developer **5**, specified toner powder particles are adhered to the surface of the photoconductive member **2** according to the electric charge pattern, to form a toner pattern. The toner pattern thus formed is transferred by the transfer device **6** onto the copy paper sheet M and is heated to be fixed thereon. After the transfer process, residual toner powder particles remaining on the photoconductive member **2** are removed therefrom by the cleaner **7**. Further, residual electric charges remaining in the photoconductive member **2** are removed by the light eraser **8**. These process steps are continuously carried out with the rotation of the rotational drum **1**.

The light eraser **8** includes an LED (Light-Emitting Diode) unit **82**, a photodiode (hereinafter called the PD) **83**, and a light-quantity control portion **84**. The LED unit **82** has, in the direction perpendicular to the face of the copy paper sheet, a plurality of LEDs disposed along a length equal to the width of the photoconductive member **2**. The LED unit

82 applies light from the LEDs to the photoconductive member **2**, to optically remove residual electric charges remaining on the photoconductive member **2**. The PD **83** receives light from the LED unit **82** through a lightguide plate **81**. The PD **83**, therefore, has the same length as the LED unit **82** in the direction perpendicular to face of the copy paper sheet. In response to an output from the PD **83**, the light-quantity control portion **84** controls the light-emission amount of the LED **82**.

The lightguide plate **81** has, at upper parts of the image forming portion B, a lightguide plate body portion **811** and a divergence portion **812**. The lightguide plate body portion **811** has a cross section of a rectangular shape elongating in the axial direction of the rotational drum **1** and is disposed in the direction in which the image forming portions B are arranged side by side. The divergence portion **812** diverges from a face **811***c* of the lightguide plate body portion **811** on the side of the image forming portion B and has an endmost face which is located between the cleaner **7** and the charger **3** so as to face the photoconductive member **2**. The divergence portion **812** is formed, in cross section, into a rectangular shape having a length covering that of the photoconductive member **2**.

The LED unit **82** is arranged, with respect to the horizontal direction of the copy paper sheet face, in close proximity to one end face (**811***a*) of the lightguide plate body portion **811**. On the other hand, the PD **83** is arranged, with respect to the horizontal direction of the copy paper sheet face, in close proximity to the other end surface (**811***b*) of the lightguide plate body portion **811**. As a result of such arrangement, a first part of light L from the LED unit **82** incident on the end face **811***a* of the lightguide plate body portion **811** branches off into each divergence portion **812**, and a second part of the light L travels straight through the lightguide plate body portion **811**, is radiated from the end surface **811***b* of the lightguide plate body portion **811**, and is received by the PD **83**.

Light rays **L1–L4**, branched off into the divergence portions **812**, respectively, are transmitted along the longitudinal direction of the divergence portions **812**. Thereafter, each light ray **L1–L4** is applied from the endmost face of the divergence portion **812** to the photoconductive member **2** at a luminous flux corresponding in length and width to the endmost face of the divergence portion **812**. As a result, each of the photoconductive members **2** is optically discharged.

The divergence of light rays to the divergence portions **812** may be made by forming, at a specified position of the lightguide plate **81**, a reflection or refraction portion capable of reflecting or refracting the light L from the LED unit **82** to the divergence portions **812**. For example, for the light L from the LED unit **82** to be reflected in the directions of the divergence portions **812**, a side face **811***d* of the lightguide plate body portion **811** on the side opposite to the divergence portions **812** (i.e., the upper face of the lightguide plate body portion **811** of FIG. **1**) is formed into a tapered face which inclines so that the lightguide plate body portion **811** continuously decreases in its thickness or height as it extends from the end face **811***a* to the end face **811***b*. Further, an arrangement may be made in which a reflection portion is formed all over the side face **811***d* or at a certain area of the side face **811***d* facing the divergence portion, by affixation of reflection tape or vapor deposition of aluminum in order that the light L is reflected to each of the divergence portions **812** with high efficiency. Alternatively, another arrangement may be made in which areas of the side face **811***d* other than the area thereof that faces the divergence portion are coarsened for the purpose of diffusing light rays toward the divergence portions **812**. In addition, such a step that diverges the light L incident on the end face **811***a* of the lightguide plate body portion **811** toward the divergence portions **812** with high efficiency may be taken as the need arises.

As described above, the PD **83** receives a part of the light L emanating from the LED unit **82** that travels straight in the longitudinal direction of the lightguide plate body portion **811**. As the light quantity of the light rays **L1–L4** which diverge to the divergence portions **812** decreases, the quantity (Lp) of light entering the PD **83** likewise decreases. Therefore it becomes possible to perform control so that the light quantity of the illumination light rays **L1–L4** for the photoconductive members **2** is set to a fixed value required for the removal of electric charges, by detecting an output from the PD **83**.

The light-quantity control portion **84** has a voltage conversion circuit **85**, a microcomputer **86**, and an LED light-emission amount control circuit **87**. The voltage conversion circuit **85** functions to convert an output from the PD **83** into a voltage. The microcomputer **86** receives an output from the voltage conversion circuit **85** and A/D converts same for comparison with a reference value, thereby to generate a signal used to control the light-emission amount of the LED unit **82**. The LED light-emission amount control circuit **87** functions to control, based on an output from the microcomputer **86**, the light-emission amount of the LED unit **82**.

The microcomputer **86** has an analog input port AD and two digital output ports DA**1** and DA**2**. Each of the digital output ports DA**1** and DA**2** is set at eight bits (variable from 0 to 255, i.e., 256 value levels). The total of output values from these two digital output ports DA**1** and DA**2** (from 0 to 510) is used for the controlling of the light-emission amount of the LED unit **82**. The output value of the PD **83** is used for comparison/decision with respect to the light-emission reference value of the LED unit **82**.

In the present embodiment, the LED unit **82**, made up of LEDs arranged side by side in the photoconductive member crosswise direction (i.e., the copy paper sheet face vertical direction), is employed as a light source common to the four photoconductive members, which, however, should not be considered restrictive in any way. As a light source common to a plurality of photoconductive members, halogen lamps each running the photoconductive member crosswise direction may be employed. Further, in the present embodiment, the light-guide plate is employed as a lightguide member for guiding light rays from the common light source to each photoconductive member, which, however, should not be considered restrictive in any way. As a member for guiding light, for example, a bundle of optical fibers may be employed. In other words, it suffices that a part of light rays from a light source common to a plurality of photoconductive members are guided to the photoconductive members. Further, it suffices that the remaining part of the light rays from the light source is guided to the PD.

Next, the operation of the light-quantity control portion **84** will be described below with reference to a flowchart diagram of FIG. **2**.

In FIG. **2** as well as in the following description, S denotes a step. In the following description, increasing the light-emission amount of the LED unit **82** is referred to as power up.

Referring to FIG. **2**, at **S31** the microcomputer **86** first determines whether a request for the power up of the LED unit **82** is set.

If no LED power up request is set (i.e., the "NO" branch from S31), an output from the PD **83** is detected at S**33**. On the other hand, if the request is set (i.e., the "YES" branch from **S31**), it is determined at **S32** whether the value of the output port DA1 of the microcomputer **86** (from 0 to 255) amounts to FF, i.e., the upper limit (255).

If the value of the output port DA1 of the microcomputer **86** is at its upper limit (255) at **S32** (i.e., the "YES" branch from **S32**), it is impossible to further increase the value of the output port DA1. Accordingly, the microcomputer **86** adds to the value of the output port DA2 (0–255) one (one value level which is the control minimum unit amount) at **S34**. This is made to serve as a set value of the output port DA2 and, thereafter, it is determined at **S35** whether the value of the output port DA2 is zero. If the value of the output port DA2 is zero in spite of the addition of one to the value of the output port DA2 at **S34** (i.e., the "YES" branch from **S35**), it is then considered that the LED unit **82** is in an abnormal condition. The abnormal processing of the LED unit **82** is carried out and the control routine is terminated. On the other hand, if the value of the output port DA2 is not zero (i.e., the "NO" branch from **S35**), the control routine advances to **S33**.

If a decision result of **S32** shows that the value of the output port DA1 is not at its upper limit (255) (i.e., the "NO" branch from **S32**), this indicates that there is a margin for the value of the output port DA1 to be increased. Therefore, one is added to the value of the output port DA1 at **S37**. This is made to serve as a set value of the output port DA1 and the control routine advances to **S33**.

After having detected an output from the PD **83** at **S33**, the microcomputer **86** determines, at **S38**, whether the output value of the PD **83** exceeds a reference value, in other words the microcomputer **86** determines whether the power of the LED unit **82** exceeds the reference value. If the power of the LED unit **82** is in excess of the reference value (i.e., the "YES" branch from **S38**), then the request for the power up of the LED unit **82** is cleared at **S39**. It is then determined at **S40** whether the value of the output port DA2 is zero. In other words, it is determined whether the total of output values of the output ports DA1 and DA2 exceeds the upper limit of the output port DA1 (255).

If the value of the output port DA2 is zero (i.e., the "NO" branch from **S40**), this indicates that the value of the output port DA1 is not in excess of the upper limit. Accordingly, it is possible to perform power reduction control of the LED unit **82** by changing the value of the output port DA1. Accordingly, at **S41** one is subtracted from the value of the output port DA1 and the result is made to serve as a set value of the output port DA1. Subsequently, it is determined at **S43** whether the value of the output port DA1 is zero. If the value of the output port DA1 is zero (i.e., the "YES" branch from **S43**), this indicates that the LED unit **82** is in an abnormal condition, and the control routine advances to LED abnormal processing of **S36**. On the other hand, if the value of the output port DA1 is not zero (i.e., the "NO" branch from **S43**), this indicates that the LED unit **82** is in a normal condition. Then, the control routine is terminated.

If a decision result of **S40** shows that the value of the output port DA2 is not zero (i.e., the "NO" branch from **S40**), this indicates that the value of the output port DA1 have amounted to the upper limit (255) and there is need for power reduction control by manipulating the value of the output port DA2. One is therefore subtracted from the value of the output port DA2 at **S42** and the result is made to serve as a set value of the output port DA2. This is followed by termination of the control routine.

On the other hand, if a decision result of **S38** shows that the power of the LED unit **82** falls below the reference value (i.e., the "NO" branch from **S38**), a request for the power up of the LED unit **82** is set at **S44**. The control routine is terminated and, thereafter, is again repeated. Then the light-emission amount of the LED unit **82** (i.e., the detected output amount of the PD **83**) amounts to above the reference value and, when the fact that the LED light-emission amount exceeds the reference value is confirmed, the LED power up request is cleared. Then the total of output values of the output ports DA1 and DA2 of the microcomputer **86** is set to a value lower by one than the reference value.

In the way as described above, the output value total of the output ports DA1 and DA2 is set to a value which is lower by one than the reference value even when automatic light-quantity control of the LED unit **82** is started from any condition. As a result, the light-emission amount is kept at a fixed value. In other words, the illumination amounts L1–L4 to the photoconductive members **2** are controlled at a desired value for each photoconductive member.

The present invention embodied as shown in FIGS. **1** and **2** is applied to the full-color photocopier A having the image forming portions B. The present invention is also applicable to an image forming apparatus having only one image forming portion (photoconductive member), as shown in FIG. **3**.

FIG. **3** shows a rotational drum **1**, a photoconductive member **2** applied around the circumferential surface of the rotational drum **1**, and a light eraser **8**. The light eraser **8** has a lightguide plate **81** extending along the longitudinal direction of the rotation drum **1**, an LED **82** as a single light source disposed in close proximity to one end face **81***a* of the lightguide plate **81** with respect to the longitudinal direction thereof, a PD **83** as a light receiving means disposed in close proximity to the other end face **81***b* of the lightguide plate **81** with respect to the longitudinal direction thereof, and a light-quantity light control portion **84** which receives an output from the PD **83** and which controls the light quantity of the LED **82**.

The lightguide plate **81** is formed of acrylic resin, having a length corresponding to that of the photoconductive member **2**. Further, the lightguide plate **81** is formed in cross section into a rectangular shape which elongates in the radial direction of the photoconductive member **2**, wherein one side face **81***c* of the lightguide plate **81** (i.e., a lower face of the lightguide plate **81** in FIG. **3**) on the side of the photoconductive member **2** is oriented face to face with the photoconductive member **2**. Moreover, in order to form light rays L1–Ln for illuminating the photoconductive member **2** by reflecting light rays incident from the LED **82** in the direction of the photoconductive member **2**, the other side face **81***d* of the lightguide plate **81** on the opposite side to the photoconductive member **2** is formed into a tapered face which inclines so that the cross-sectional length of the lightguide plate **81** continuously decreases as it extends from the end face **81***a* to the end face **81***b* with respect to the longitudinal direction. The tapered face **81***d* may be formed into a reflection face by aluminum vapor deposition or by affixation of reflection tape.

The LED **82**, the PD **83**, and the light-quantity control portion **24** are identical in configuration and operation with the embodiment shown in FIGS. **1** and **2**.

In the embodiment shown in FIG. **3**, the light L, emitted from the LED **82** to enter one end of the lightguide plate **81** with respect to the longitudinal direction, is reflected by the upper side face **81***d* of the lightguide plate **81** which is a tapered face, toward the rotational drum **1**, thereby becoming light rays L1–Ln which are then applied from the side face **81***c* of the lightguide plate **81** on the photoconductive member side to the photoconductive member **2** of the rotational drum **1**. On the other hand, a part of the light L from the LED **82** travels straight through the lightguide plate **81** to the PD **83** at which the light L is received. As in the embodiment shown in FIGS. **1** and **2**, the light-quantity control portion **84** performs control according to the quantity of light received by the PD **83** so that the light-emission amount of the LED **82** is kept at a fixed value. In the way described above, the quantity of light for illumination of the photoconductive member **2** is kept at a fixed value, whereby stable electric charge removal can be carried out.

In the foregoing embodiments, the description has been made in which the microcomputer **86** of the light-quantity control means **24** has the two 8-bit digital output ports DA**1** and DA**2**. A microcomputer of a different type may be used which has a different number of bits and a different number of output ports.

Although the present invention has been fully described by way of examples with reference to the accompanying drawings, it is to be noted that various changes and modifications will be apparent to those skilled in the art. Therefore, unless such changes and modifications depart from the scope of the present invention, they should be construed as being included therein.

What is claimed is:

1. An image forming apparatus comprising:

a plurality of photoconductive members on each of which an electrostatic latent image is formed;

a light source for emitting light rays; and

a waveguide member including a body portion where the emitted light rays enter and a divergence portion by which the emitted light rays are made to branch off from the body portion and are guided to the plurality of photoconductive member, wherein

the photoconductive members are illuminated with the light rays, emitted from the light source and passed through the divergence portion, so that the photoconductive members are discharged, and

the body portion tapers along the incident direction of the light rays from the light source.

2. An image forming apparatus comprising:

a plurality of photoconductive members on each of which an electrostatic latent image is formed;

a light source for emitting light rays; and

a waveguide member including a body portion where the emitted light rays enter and a divergence portion by which the emitted light rays are made to branch off from the body portion and are guided to the plurality of photoconductive member, wherein

the photoconductive members are illuminated with the light rays, emitted from the light source and passed through the divergence portion, so that the photoconductive members are discharged, and

the body portion has a reflection portion located face to face with the divergence portion.

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